

# *The Citrus Industry*



## *The New Year 1946*

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## Citrus Suggestions For 1946...<sup>re</sup>

J. Francis Cooper  
Extension Editor, College of Education

Since citrus is a tree crop not easily subject to annual acreage changes, the Florida goals committee did not set any 1946 citrus goals at its meeting in Gainesville December 20. However, the committee did make some pertinent observations and suggestions which should be of interest to all growers. Its report, which has been forwarded to the Production and Marketing Administration in Washington follows:

This committee does not feel that it can do anything to adjust citrus production goals and only wishes to bring to your attention the needs of citrus and its possibilities for the last six month's harvesting season of 1945-46 and the production period for the year 1946.

There has been an estimated citrus planting of 50,000 acres during the last three years which will bring about heavy increased production after this planting comes into bearing. The production for 1944-45 was 68,000,000 boxes. The estimated production for 1945-46 is 86,000,000 boxes and, from all indications, by 1949-50, if not interfered with by the elements or other factors, will reach approximately 125,000,000 boxes. This year's production of citrus is experiencing difficulty in getting import materials for fertilizer and also what we know as minor elements such as manganese, zinc and copper. The Government should assist in making available these materials. There is also an apparent shortage of citrus labor and the supply of foreign labor such as the Bahamians and Jamaicans, and migratory labor, should be made available and funds appropriated to carry on this work, if it has not already been done, at least to June 30, 1946, and serious consideration should be given to the problem so as to carry on for another year if advisable.

Future production of citrus will be based, of course, on purchase power, increased production, marketing and distribution of products through fresh fruit market and present methods of processing and new methods to be developed. It must be understood that if supply

is greater than demand and citrus prices break severely it will naturally have a tendency to influence the producer to cut down his cost of production, and the abandonment of marginal groves, reduced application of fertilizer and spraying, all of which would affect quality and production during this period. The producer must watch this condition so as not to be caught in a squeeze between fast reducing prices and much slower reduction in other costs such as labor, supplies, distribution and marketing.

In view of the loss to citrus of the Government purchase for the army, lend lease, and the loss of export during the war period, every

effort should be made to assist citrus growers in disposing of as much citrus through Government purchase through UNRRA.

The citrus goals committee was composed of L. H. Kramer, Lake Wales grower, chairman; G. H. Blackmon, head of the Horticulture Department in the University of Florida Agricultural Experiment Station; Frank L. Holland, Winter Haven citrus figure; M. F. Miller, Lakeland, Production and Marketing Administration; and Dr. L. O. Gratz, assistant director of the Experiment Station.

Other goals adopted at the same time recommended increased production of milk, hens, pullets and eggs and feed crops. Decreases were suggested for peanuts and chickens for meat.



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## Present Status Of DDT As An Insecticide

### PART TWO

#### Pests of Other Fruit Crops

Many of the most potent insect enemies of fruit crops are falling victims of the continued advance of DDT as an agricultural insecticide. Some examples should prove interesting.

The Japanese beetle (*Popillia japonica* Newm.) continues to spread in the United States and has been found several times in the state of Florida. It is a primary pest of fruit crops, vegetables, ornamentals, and forest trees. DDT is proving to be one of the most potent insecticides ever used against this species. Tests indicate that 0.25 pound per 100 gallons of water is as effective as 6 pounds of lead arsenate. Such a dilute spray will also have an effective residual effect for 10 days. An increase in the concentration of the field spray increases the toxicity value and extends its protective period as a residual. Fleming and Chisholm (22). Laboratory investigation of DDT as a control for Japanese beetle larvae in soil indicate that it will doubtless tend to replace lead arsenate for this purpose. Fleming and Maines state, "pound for pound, or molecule for molecule, DDT appears to be 100 times as toxic to the larvae in the soil as is lead arsenate." Fleming

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This paper was presented at meeting of Florida State Horticultural Society:

and Maines (23).

DDT may also be effectively used either as a liquid or solid media as a killing agent in automatic Japanese beetle traps. Langford et al (24).

The codling moth (*Carpocapsa pomonella* (L.)) is another leading American fruit pest which succumbs to DDT. Preliminary laboratory and field tests indicate that certain formulations may be much more effective than the standard lead arsenate spray. A mixture of the two seems to intensify the action of both lethal agents. Steiner, Summerland, and Arnold (25).

DDT dusts and sprays are effective in the control of the oriental fruit moth (*Grapholita molesta* (Busck)). Another primary pest of peaches in the South is the plum curculio (*Conotrachelus nenuphar* (Hbst.)). Thus far this species has not responded very well to the formulations of DDT which have been tested.

#### Pests of Cereal and Forage Crops

Several species of grasshoppers have shown susceptibility to DDT-Pyrophyllite dusts, DDT sprays, and baits. These include *Melanoplus mexicanus* (Sauss.), *M. bivittatus* (Say), *M. femur rubrum* (Deg.), and *Camnula pellucida* (Scudd.). The DDT dust is applied at the rate of 15-20 pounds per acre and is especially effective where the vegetation is dense. The spray suspensions of DDT-Pyrophyllite plus a sticker have a better residual effect than the dust. Packard (26), Parker (27).

Barriers consisting of 5 per cent DDT-Pyrophyllite dust serve as protection against immature stages of the chinch bug (*Blissus leucopterus* (Say)). Such dusts also act as a contact poisons when applied directly to the species. Packard (20). However, some workers claim that it is slower and not as effective as dinitro-O-cresol. Decker (28). The author has found 3 per cent DDT dust effective as a contact poison against the grass chinch bug (*Blissus leucopterus insularis* Barber).

A dust containing 3 per cent or less of DDT in pyrophyllite constitutes an effective control for the velvet bean caterpillar (*Anticarsia gemmatalis* (Hbn.)). Residual sprays

are also effective. Packard (26).

The European corn borer (*Pyrtausta nubilalis* (Hbn.)) may be effectively controlled on sweet corn by 3-6 per cent DDT in pyrophyllite dust at 1.2 to 3 pounds of DDT per acre. Packard (263).

Russell reported the successful control of the corn earworm (*Heliothis armigera* (Hbn.)) by use of DDT-talc dust. Russell (29). Other workers have reported successful control of this species with dusts and with oil DDT injections or atomization.

Tests have revealed that DDT is an effective contact as well as stomach poison when applied in the control of the white fringed beetle (*Pantomorus leucoloma* (Boh.)). DDT dust is far superior to sodium flucaluminate as a stomach poison, while 1/8 pound per 100 gallons of water is just as effective as 8 pounds of synthetic cryolite per 100 gallons of water. Young (30).

#### Pests of Stored Seed, Grain, and Milled Cereals Products

DDT is toxic to the most important insects attacking stored seed, grain and milled products, and will be usable under certain conditions in the control of such pests as the rice weevil (*Stiophilus oryzae* (L.)), the confused flour beetle (*Tribolium confusum* Duv.), the red flour beetle (*T. castaneum* (Hbst.)), the lesser grain borer (*Rizopertha dominica* (F.)), the saw-toothed grain beetle (*Oryzaephilus surinamensis* (L.)), larvae of the Indian meal moth (*Plodia interpunctella* (Hbn.)), the adult granary weevil (*Sitophilus granarius* (L.)), and larvae of the cadelle (*Tenbrodes nauritanicus* (L.)).

Cotton et Al., report that the aforementioned insects were killed when infested wheat was treated with DDT and DDT-Pyrophyllite dust. They also report favorable protection of packaged and bulk seeds. Bags treated with DDT gave protection, while DDT oil spray was useful in cleaning up the cadelle when it had bored into woodwork of farm granaries, railway box cars, and warehouses. Cotton et Al. (31).

#### Pests of Sugarcane

Research by entomologists reveals that DDT-Pyrophyllite dust at a 10 per cent level is less effective in the control of the sugarcane borer (*Diatraea saccharalis* (F.)) than synthetic cryolite or fluosilicates. DDT sprays also failed to give satisfactory control. The yellow sugarcane aphid (*Sipha flava* (Forbes))

greatly increases following DDT applications. Ingram et Al. (32).

#### Pests of Cotton

Research pertaining to the use of DDT in the control of pests of cotton have revealed several things of interest.

In the specific formulations that have been thus far employed DDT has failed to show any practical promise in the control of the boll weevil *Anthonomus grandis* Boh., or the cotton leafworm (*Alabama argillacea* Hbn.). The boll weevil has been rather successfully controlled for a period of years by the use of calcium arsenate while the cotton leafworm is easily controlled with this poison. The fact that neither have been successfully controlled with DDT is interesting and significant.

The cotton aphid (*Aphis gossypii* Glov.) is increased by applications of DDT. The increases approximate that following calcium arsenate applications in the control of boll weevil. The Common red spider (*Tetranychus* sp.) is also increased by DDT applications.

Pink bollworm (*Pectinophora gossypiella* (Saund.)) is the most dangerous enemy to cotton production in the world. It has presented tremendous control problems for many years. A satisfactory chemical control has not been developed. The fact that DDT is proving to be effective in the control of this great pest is a fact of great significance to Southern agriculture, in view of the fact that this pest is established in sections of the southwest and has spread into several parishes in Louisiana. It has occurred in wild cotton in South Florida and isolated loci have occurred in other sections of the state, but have been eliminated.

DDT is also effective in the control of such pests as the bollworm (*Heliothis armigera* (Hbn.)), the cotton flea hopper (*Psallus seriatius* (Reut.)), the onion thrips (*Thrips tobaci* Lind.), and the tobacco thrips (*Frankliniella fusca* (Hinds)). Doftin (33).

#### Pests of Forest Trees

In discussing the potentialities of DDT in the control of forest insects, Craighead and Brown stated, "Experiments indicate that no development in the last 25 years has offered so much promise for the control of many forest insects, particularly defoliators." DDT is far more effective in low concentrations than any other commercial insecticide. Because of the small amount required

per acre, it is especially well suited to application from airplanes, and indications are that it may make possible the protection of extensive areas of valuable timberland. The remarkable residual qualities of the DDT deposit make it particularly well adapted for the control of certain species." These authors found that solutions and emulsions were much more effective than suspensions or dusts. Craighead and Brown (34).

Indications are that aerial applications of DDT solutions and emulsions of DDT solutions and emulsions at the rate of 2-5 lbs. of DDT per acre will effectively kill the gypsy moth (*Lymantria dispar* (L.)), the green-striped maple worm (*Anisota rubicunda* (F.)), the red-headed sawfly (*Neodiprion lecontei* (Fitch)), and the spruce budworm (*Archips fumiferana* (Clem.)).

DDT may also prove of value in the protection of valuable logs from attack by wood borers and termites, and for protecting living trees from bark beetles. It effectively controls leafhoppers and treehoppers. Other forest insects that submit to the toxic effects of DDT are the eastern tent caterpillar, the fall cankerworm, the fall webworm, and the boxwood leaf miner. Dowden and Torones (35).

#### Pests Affecting Health and Comfort of Men and Domestic Animals

Though the publication in which this article will be released deals exclusively with problems in plant production and marketing, any discussion of the "Present Status of DDT as an Insecticide" that did not briefly discuss the striking results that have been obtained in the control of insect pests and disease vectors affecting man and domestic animals would be defective. This is true because it was actually in this field of insect control that the tremendous powers of insect control possessed by DDT were first demonstrated, and the research has been intense due to the importance of such insects on the war and home fronts during the world conflict which has just terminated. The results obtained in these studies constitute some of the most striking research findings of modern times, and have resulted in a great saving of human life.

DDT may be used in effectively controlling the adults of the malaria mosquito (*Anopheles quadrimaculatus* Say), and the common house fly (*Musca domestica* L.), which

are important vectors of malaria fever and typhoid fever respectively. For residual spraying DDT is dissolved in a kerosene base such as Ultrasene or Deo Base Oils and applied to fly frequented surfaces at the rate of 100-400 mg. per square foot. A 3-5 per cent DDT solution may be used. Water emulsions may also be employed for this type of residual spraying. The author has obtained excellent protection from the common housefly for a period of one year by applying DDT-oil spray in a cafeteria area at the rate of 200 mg. per square foot. Wise-mann (36), Lindquist et Al. (37 and 38).

The larval stages of the common housefly and the malaria mosquito are effectively controlled by DDT. The immediate widespread use of DDT as a mosquito larvicide under domestic conditions might be inadvisable because of the paucity of information relative to the effect of this compound upon beneficial insects, wild life, and fish.

The body louse (*Pediculus humanus corporis* Deg.), and the public louse (*Phthirus pubis* L.) are effectively controlled and protection maintained for a period of 30-40 days by 10 per cent DDT-Pyrophylite dust. Such dusts have been effectively used in preventing epidemics of typhus fever thru louse campaigns, in the North African and European theatres of war. Bushland et At. (39 and 40).

Cotton and woolen clothes may be effectively louse proofed by use of solutions and emulsions of DDT. Jones et Al. (41).

Fleas, the vectors of the important diseases, bubonic plague and endemic typhus, succumb to the effects of dust or spray formulations of DDT. The author has successfully protected treated dogs from attacks by cat fleas (*Ctenocephalides felis* (Bouche)), for periods ranging from 3-6 weeks. Shampoo applications of 2 per cent DDT oil formulation that is miscible in water were used. The larval stages of fleas are also destroyed by dusts or sprays.

Bedbugs are one of the most common household pests in the world. Fortunately there is no human disease that is known to be transmitted by these blood sucking pests. Formulations of DDT may be effectively used as residual sprays for the common bedbug (*Cimex lectularius* L.), and the tropical bedbug (*C. hemipterus* F.). Both of these species occur in Florida. In

practical tests 5 per cent DDT in non-standing kerosene base oils have provided protection for 5-11 months when applied as a wet spray at 100 mg. DDT per square foot. Madden et Al. (42).

Roaches are also tremendous pests in Florida and because of their very unclean habits they constitute a menace to health. The author has conducted numerous tests with DDT in the control of the German cockroach (*Blatella germanica* (L.)), and the American cockroach (*Periplaneta americana* (L.)). A a and 10 percent DDT-

Pyrophyllite dust and a 2 per cent DDT in Ultrasene base oil were employed. These tests revealed that either of these three materials are quite effective as contact controls. The DDT oil sprays seem comparatively ineffective as a residual, while proper quantities of the 10 per cent DDT dust offer some possibilities as a residual, but the practical tests did not reveal any great advantage over sodium fluoride.

DDT dusts and sprays may be employed as contact poisons for sev-

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eral species of ants and as barriers to prevent entry into home.

In the field of pests affecting cattle and other domestic animals DDT has definite uses. The author has conducted numerous tests on the control of the horn fly (*Haematobia irritans* L.), the dogfly or stablefly (*Stomoxys calcitrans* (L.)), and the cattle lice. Water emulsions of suspensions of DDT as low as 0.15 to 1.5 per cent will relieve cows from attack by hornflies immediately after application and residually protect them for 2 to 4 weeks, or possibly longer. Applications of .5 to 2 per cent will kill cattle lice. A second application after ten days may be advisable. Concentrations of the spray have to be greater to give suitable protection from the dog fly.

Thus the true screwworm (*Cochliomyia americana* C. and P.), and cattle grubs do not seem susceptible to the formulations that have been tested by several research workers.

#### Looking Forward

The tremendous potentialities of DDT as an insecticide encourage trained entomologists to attempt to visualize its use in future years. Probably it is fortunate that this poison was not available for widespread domestic use during the few years since its insect toxic value was determined. This is true because of certain limitations upon its use in the control of pest insects, disease vectors, and agricultural pests. It has now been released for domestic use. This forced delay in the general use has permitted a more careful appraisal of the poison from the standpoint of its value as an insect toxicant and its toxicological effect upon man and other animals. However, there is great need for continued study. It should only be used in accordance with recommendations made by recognized entomologists as it is potentially dangerous to man and domestic animals. The research data reported thus far have been based upon laboratory, and small field tests. Thus it is illogical for entomologists to make overall recommendations for the widespread field uses of this compound. The season of 1945 has presented the opportunity for extended field tests, and the results of these tests will serve as a partial guide for specific recommendations. The next five year period will constitute the most crucial period in the history of DDT. It will either make or break itself as an agricultural insecticide

during that period. The judicious and not foolish use of the compound will give it the proper opportunity to establish its place in the insect control complex. The statements made in this paper relative to the toxic range of this poison should not necessarily be interpreted as recommendations for the field use of DDT formulations, except in the domestic animal and household pest control fields.

In the household pest control field it will reach great heights in post war years. The bedbug will definitely pass from the field as a nuisance in the home. The presence of the common housefly in the home or public places in future years will constitute a reflection upon those charged with the responsibility of maintaining clean human environments. The control of ants, roaches, silverfish, and clothes moths may be aided by use of this compound. Fleas can be eliminated from pets and the home.

Many outstanding insect vectors of human and animal diseases may be partially or totally eliminated. Some consider the discovery of this compound as important to the field of preventive medicine as the discovery of anaesthetics was to surgery. Widespread control or eradication campaigns of such dangerous pests as malarial mosquitoes will have to be undertaken gradually and only after a careful appraisal has been made of the effects of this poison upon beneficial insect predators and parasites, fish, and wildlife. It is toxic to some parasitic and predacious insects, to honeybees and in certain concentrations to some fish. The abnormal destruction of beneficial insects might release many non-economic pests into the economic field, and thereby wreak havoc with agricultural stability.

Certainly it is quite possible that it might be governmentally sound for the several states to legislate against the possible haphazard use of this and other compounds which may be subsequently developed. It would seem quite within the realm of governmental farsightedness to only permit such state uses after approval by specially appointed committees consisting of Professional Entomologists and Conservation officials.

In the Agricultural insecticide field it will unquestionably have some outstanding uses in the control of major pests of fruit crops, vegetables, field and storage crops, and livestock. However, it will not con-

stitute a panacea for all of the pest problems of agricultural crops. Here again many factors must be considered such as the effect upon beneficial insects, including parasites, predators, pollinating species, dangerous residues on edible parts of plants; absorption by animals and elimination in consumable products of the body; soil residues; and the possibility of the development of DDT resistant biological races of economic species of insects.

The discovery of the insect toxic quality of DDT has fired the imagination of entomologists, insecticidal chemists, doctors, and many other scientific people. The structural formula of this compound gave no clue to scientific personnel relative to its toxic value as an insecticide. This will stimulate the investigation of countless thousand of other compounds.

There will be developed additional compounds that have excellent toxic value on a wide range of insects, and good residual qualities. Already, under the stimulus of DDT results, some compounds, such as Hexachlorocyclohexane ("666"), are entering research channels.

It is quite evident that we are now entering a new insect control era. We are well equipped for this period in human affairs with thousands of entomologists who ask mainly for the opportunity to serve. If they are provided with the wherewithal to make the proper scientific appraisals of new chemical developments mankind throughout the world will reap the benefits.

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## PRESENT PRICES—FUTURE OUTLOOK

Despite uncertainty as to final federal action in regard to control of citrus prices and marketing conditions, with temporary suspension of ceiling prices, threat of ending the suspension, refusal to grant a citrus holiday over the year-end, plus early uncertainty as to the size and quality of the crop due to the excessive late bloom; despite all this Florida citrus growers have so far experienced a most satisfactory season.

With congestion of transportation facilities restricting the movement of California and Texas fruit to market, with the excellent quality of the Florida product, plus an active demand on the part of the ultimate consumer with abundant funds for the purchase of a product which his palate has come to demand, the outlook for continued good prices seems to be bright.

What the citrus growers of Florida and other producing sections need to be concerned about is not so much the immediate future as the long range picture. The thing citrus growers need to study and ponder is how to meet the situation which will develop when all our young non-bearing groves come into bearing, when the hundreds of thousands of new trees just starting are added to the millions now in production.

The impetus given to the consumption of citrus fruits by government purchases and for lend-lease during the war years, plus the new channels opened up by the high prices received by wage earners, will doubtless be carried over to great extent during peacetime; ever increasing demands of canners, manufacturers of concentrates and newly discovered processing methods, all will play a part in helping to absorb the ever-increasing production. New methods of marketing both fresh and processed fruit are coming into vogue and gaining in popularity.

Doubtless growers will find a way to profitably dispose of the heavy increase in production which may be expected within the next few years. In the past we have met rapidly increasing production by the discovery of new channels and the creation of new demands.

Growers, processors and distributors must pursue the same tactics to meet the situation with which they soon will be confronted; they must be on the alert to take advantage of every opportunity to expand their market. In late years growers have wonderfully improved their cultural practices and improved the quality of their fruit; they must now devote their intelligence and their efforts to the cultivation of new markets and the improvement of methods of processing and distribution. Steps toward this end are constantly being taken—which augurs well for the future of the industry. Growers have every reason to look to the future with confidence—but they must be “on their toes.”

## LOOKING BACKWARD

The Citrus Industry Magazine with this issue enters Volume Twenty-Seven.

During the twenty-six years since the first issue of the magazine was printed, there has been a wonderful change in the citrus industry of Florida. Processing of citrus was still largely a dream in the minds of a few enthusiasts, the amount of fruit thus converted was negligible; marketing was largely a matter of hit-or-miss—and as frequently as not it was “miss” so far as profits to the grower were concerned. Packing plants as they are known today were unheard of; modern processing plants with investments running into the millions were undreamed of.

The use of citrus wastes for stock feed was unknown, manufacture of molasses and alcohol from citrus was an unknown quantity. Citrus rind and citrus pulp, in the few processing plants then in existence, was dumped along the roadsides to fester and become an abomination—a stench in the nostrils of the passersby. Yes, there has been a big change in the citrus industry in twenty-six years.

The past twenty-six years have been good years for the citrus industry of Florida, though not without their periods of temporary discouragement. The years ahead are full of promise for the industry.

The importance of fertilizers in the cultural program of citrus growers in Florida is emphasized by the fertilizer report for October issued by Commissioner of Agriculture Nathan Mayo. In that month a total of 77,266.3 tons of fertilizer were purchased by Florida growers. Of this amount, 66,107.3 tons were bought by growers in the citrus producing counties of the state. That is better than 85 percent of the total fertilizer consumption of the state going into citrus production.

With shipment of early bloom fruit starting a full month earlier than usual and with a great crop of late bloom fruit coming on, the present shipping season promises to be one of the longest in the history of the citrus industry in Florida.

# The U. S. Horticultural Council And Future Citrus Exports

(Concluded from last issue)

If one considers the year 1938-39, the last full season before the outbreak of the war, almost 10,000,000 boxes of citrus, including that in processed form, were shipped from the United States. This figure includes shipments to Canada of 4,380,000 boxes of oranges and grapefruit or 56 percent of our fresh citrus exports. In a country with an annual production of from 150,000,000 to 180,000,000 boxes of citrus, this amount may not seem significant. However, finding an outlet for an additional 10,000,000 boxes can substantially increase prices. Using 1933-44 relations, when winter orange production increased 1,000,000 boxes, there was a 3.4 cents decrease in price per box. The comparable figure for grapefruit was 2.7 cents per box. <sup>1/</sup> Thus exporting 5,000,000 boxes of winter oranges and 5,100,000 boxes of grapefruit could increase the overall price received by growers of 17 and 14 cents respectively. With increased production the same relationships of 1933-44 would not prevail. However, if the 17 cent figure for oranges were reduced to 10 cents and the 14 cents for grapefruit to 8 cents, the benefit to Florida growers could reach \$7,750,000. <sup>2/</sup> as a result of exporting 5,000,000 boxes of oranges and 5,000,000 boxes of grapefruit. This would be the case assuming that the net price for exports was the same as the domestic price. In other words, exporting these amounts, even if done only by a segment of the industry, would hold approximately an eight million dollar umbrella over the entire industry because of increased domestic prices due to finding outlets abroad. If then, in the post-war period our pre-war volume of exports can be maintained and even expanded the stake that every

J. WAYNE REITZ

United Growers & Shippers Ass'n,  
Orlando, Fla., at Meeting of Florida  
State Horticultural Society, Orlando

citrus grower has in maximizing our exports becomes apparent irrespective of the particular groups or individuals who carry on the export operations.

It is extremely important that the citrus interests of Florida exhaust all avenues for expanding citrus exports. However, if this is to be done we shall have to depart from the methods followed in the past; namely, using Europe and other overseas markets as a dumping ground for poor quality citrus, shipping under unfavorable conditions, moving a wide variety of grades and brands, and spasmodic movements of supplies. Instead a program needs to be adopted which will insure (1) steady supplies consistent with market conditions abroad; (2) uniform quality; (3) a very limited number of brands; (4) shipping facilities including first-class refrigeration; and (5) adequate facilities and representation abroad.

To carry out such an export program will require that citrus interests in Florida assume their fair share of the job to be done. To allay any misconception, it should be recognized that prices received from abroad on individual shipments or even for periods of a month or more will not equate with domestic prices. If prices abroad are lower than domestic prices, uniform supplies must be continued in the belief that on a seasonal basis a price in the foreign market will equate with domestic prices. As a matter of fact, in the development of an export policy it may be necessary to consider average prices on a two-to five-year basis rather than on a seasonal basis. If, by equal participation, groups of shippers could obtain prices equal to domestic prices over a five-year period and, by following an aggressive policy, find an outlet for a few million additional boxes annually, they not only would benefit themselves

but would render great assistance to the Florida citrus industry.

At the moment there is every reason to believe that Canada will continue to be our major customer in foreign trade. The mechanics of handling shipments to Canada present no problem to shippers since individual concerns have developed connections for car lot sales. Where the brightest outlook for expansion exists is in England and some of the northern European countries, where large cargoes <sup>1/</sup> are involved. England normally took the bulk of citrus exports from Spain but the pre-war production of 36,000,000 boxes of oranges in Spain is reported to now be nearer 12,000,000 boxes. Another important source during the period when Florida would ordinarily ship to England was from Palestine, where again it is reported that the pre-war production of 14,000,000 boxes has been reduced to 5,000,000 or 6,000,000. It is, therefore, evident that even if England should not import citrus fruits at the pre-war level there will be for several years at least a potential market for 19,000,000 boxes of oranges in Great Britain coming from areas other than the usual source of supply. In getting a foothold on this potential market, Florida is in a peculiarly favorable position because shipping facilities probably will be made more quickly available to Florida interests than to competing states. Furthermore, Florida has a freight rate and time advantage to the European market over any competing domestic area.

It would be unfair to conclude this discussion without mentioning two very important factors as they immediately and in the long run affect our export market. At the moment the greatest barrier to export trade is foreign exchange. Great Britain is in dire financial distress, especially from the standpoint of dollar exchange. Until this bottleneck is broken, through a loan or other means, there is little hope for exports to the British Isles. Individual Englishmen have the purchasing power to buy the volumes indicated, but if the British Gov-

<sup>1/</sup>Estimates by Dr. H. G. Hamilton, University of Florida. See Citrus Magazine, February 1945, p. 10.

<sup>2/</sup> Assuming an annual production in Florida of 50,000,000 boxes of oranges and 35,000,000 boxes of grapefruit.

# Dehydrated Orange Juice

R. T. CARLTON, Secy.-Mgr., Plymouth Citrus Growers Association, Plymouth; and  
 H. R. CLOUD, V-Pres., Florida Foods, Inc., Orlando, At Meeting  
 Florida State Horticultural Society

Recently a process for dehydrating or removing the water from orange juice has been developed and this process will be exploited by Florida Foods, Inc. In evaluating the possibility of success of orange juice dehydration by Florida Foods, Inc., it might be well to examine the skills of the parent company, namely the National Research Corporation. This company was organized in 1940 for the purpose of research in all branches of industry, but more particularly in those fields where high vacuum could profitably be employed in the solution of the problem. Almost immediately after the company was formed it became engaged in war work on its own account and was presented with many technical problems by America's largest manufacturers. They were instrumental in perfecting the high vacuum equipment by which penicillin is manufactured and approximately 95 percent of the world's penicillin today is made in part by machinery and technique worked out by the National Research Corporation. In addition, they have spent considerable time on other food industry problems; on problems of the petroleum industry and a considerable amount of time on the study of the extraction of the lighter metals. One of the initial accomplishments of National Research Corporation in war work was that of perfecting a method of extracting metallic magnesium for use in the aeroplane and allied industries. Particular reference has been made in their research work to heat sensitive materials where the high vacuum technique does a splendid job.

This company is committed under contract for a period of twenty years to devote a percentage of its time and ability to the study of citrus processing and by-products. Its major compensation for this effort will be confined to the increase which it can create in the value of Florida Foods as an industry. During this period the National Research Corporation will maintain a separate laboratory in Florida for this research work. That is the background.

Ever since human beings started to travel about on the earth, they

have had to carry food with them. After being established in new places, they have always needed food products carried or shipped to them. During early times only dried products could be taken. These lacked essential vitamins and resulted in such deficiency diseases as scurvy, beriberi, pellagra, and rickets. With the advent of refrigeration, fresh fruits and vegetables could be carried along or stood for long periods of time, thus providing more palatable food and making supplies of these essential vitamins available for longer periods of time.

Research has shown that the mineral elements and vitamin C that occur in citrus juices when supplied properly not only prevent the deficiency diseases caused by their absences, but enables users to do more work, feel better, and enjoy life more abundantly.

The addition of pure dehydrated orange juice to this list of mineral

and vitamin containing food products is a still further step in extending the distribution of these necessary health products.

The use of processed fruits and vegetables and particularly citrus juices has given humanity another method of transporting, storing and reducing to a much less perishable state these necessary parts of the diet. This evolution in packing citrus products is not a new thing. Other branches of the Food Industry have gone through a similar evolution and have emerged with a more stable market and with a consuming public highly satisfied with the results of that evolution. Early in the history of the frozen food industry surveys were made by competent authorities which indicated that approximately 70 percent of the food consumed in the United States was either processed or refrigerated, or both. You are all familiar with the progress made by the Frozen Food Industry and

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their aspirations for further increase in future years. It would seem that our problems of processing an increasing amount of the Florida Citrus Crop should not cause us undue alarm as other segments of the Food Industry have successfully met this problem. It is true, however, that unless fresh citrus fruits are permitted to go to the markets in proper amounts that the excess amounts which should properly be processed and thus be withheld as fresh fruit sales will cause the entire market to break and a lower price will accrue to the grower.

Briefly orange juice powder is dehydrated orange juice and contains all the original and natural ingredients except the water. The reconstituted juice made by adding the orange powder to water is comparable to the starting material in both flavor and aroma. There is relatively no less of ascorbic acid—the important vitamin C.

Although the dried juice or powder is extremely hygroscopic and will, therefore, quickly absorb moisture when exposed to the atmosphere, when vacuum packed in vaporproof containers, it will keep indefinitely at normal room temperatures.

To produce what amounts to a 5 oz. (liquid measure) glass of fresh orange juice, merely requires stirring approximately 1 oz. (avoirdupois) of orange powder into 5 oz. of cold water. The powder goes into solution in a few seconds and the result is an orange juice having approximately 13 percent solids.

Florida Foods, Inc. Plant for producing dehydrated orange juice is expected to be in operation by March 1, 1946. It is being designed for an input capacity of 20,000 gallons of orange juice per day, with the provision being made so that this capacity can be readily expanded to 40,000 gallons per day. The process is carried out entirely at low temperature and the juice is never subject to higher than room temperatures. At one step in the process, a concentrate containing 50 percent solids is obtained. Present

plans call for 2200 gallons per day of this concentrate to be available for distribution and sale as a frozen product. The remainder of the plant will be used to produce 550 lbs. per day of dehydrated orange juice powder.

The concentrate which contains 50 percent solids is produced by vacuum evaporation and is immediately frozen, hermetically sealed in air tight containers and stored and distributed at temperatures around 0 degrees F. It has been found that this product retains 95 percent of the vitamin C in the orange juice and that it will keep for long periods when stored at proper temperatures in the absence of air. One gallon of the concentrate can be converted readily into 4.7 gallons of fresh juice by the addition of water. It is expected that this product will have a wide market especially in the institutional trade.

The orange juice powder is produced by vacuum evaporation in the micron pressure range. The large quantities of water vapor are pumped with rotary condensers which continually remove the vapor in the form of ice. The resulting powder which contains approximately 1 percent moisture is extremely hygroscopic and must be handled and packed in an atmosphere of low humidity. One pound of the powder will produce eight pounds, slightly more than 9/10ths of a gallon of orange juice. It is well to note that the powder will weigh 1/20th as much as the corresponding amount of fresh oranges. Vitamin C retention during the processing of this powder is approximately 95 percent and storage at temperatures between 70 and 80 degrees will result in no appreciable loss of Vitamin C.

In shipping oranges the major portion of the weight is made up of water, rind, pulp, and crate. An average crate of oranges weighs 90 lbs., and will produce approximately 4 1/2 gallons of orange juice. An equivalent amount of powder in cans weighs a little over 7 lbs. Moreover, the grave problem of spoilage in shipment is completely eliminated.

	Crate Fresh Oranges	Juice from 1 Crate Oranges	Pwd. from 1 Crate Oranges
Containers & Labels	80 lbs. \$.3675	45 lbs. \$.54	7 lbs. \$.084
Freight (Baltimore)	.81*	.2925	.045
	\$1.1775	\$.8325	\$.129

\*Includes Refrigeration

A comparison of the cost of containers, labels, and freight packing and transportation of fresh oranges, canned orange juice and orange juice powder as shown in table:

Conversion of orange juice to powder means several things to several classes of people. It will not crowd the fresh oranges off the fruit stand where shipments may come directly from Florida or California, but will find a receptive market.

To the families in remote sections of the country, on farms, and places not reached by the perishable food distribution system, it will mean a delicious orange drink heretofore unobtainable and an excellent source of vitamin C.

To institutions such as hospitals and schools, restaurants, dining cars, ocean liners, and air lines, it means the elimination of an expensive space consuming storage problem, an appreciable saving in labor and a dependable supply of juice consistent in quality.

To millions of housewives it means the end of the annoying time consuming squeezing of oranges before breakfast, the cleaning of squeezing apparatus, the disposal of the rinds, and the assurance of the steady source of orange juice at an economical price.

To the orange grower it means that his market can be extended both as to time and space. It is a known fact that Florida fresh citrus fruit, as such, is out of the Northern markets for approximately five months of each year and that if the public is to have the value

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of Florida citrus it must secure that citrus in the form of canned segments. This creates the necessity of educating the public to the use of two Florida citrus products; namely, fresh fruit and the canned or processed fruit. It is also true that the months in which Florida citrus is not available in fresh fruit form in the Northern markets are the months in which cold drinks are in the greatest demand. There is a belief that by the use of Florida dehydrated orange juice we may be able to extend the fresh fruit flavor and taste to these Northern markets during those months.

The area West of the Mississippi River and East of the Rocky Mountains comprises an area in which 20 percent of the population of the United States lives and because of difficulties and high cost of distribution this market has been practically closed to the sale of Florida fresh citrus fruit. Since the citrus powder equivalent to the amount of orange juice contained in a full box of oranges will be only a fraction of juice weight, it is hoped that this advantage will enable us to reach such markets and will permit the people in that area to have the advantage of the flavor of Florida fresh fruit at a price which is equivalent to that of fresh orange juice in the Eastern states.

Foreign export markets reached by infrequent and space limited transportation facilities, which now includes air transport, can be supplied with orange juice powder seven times as economically as by canned juice and 9 times as economically as fresh fruit without the attendant hazards of fresh fruit handling. This supply of orange juice powder available in remote corners of the earth will improve health, help to extend prosperous civilizations and improve trade. It is nearly inevitable that the use of oranges will be decidedly increased when the large scale production of dehydrated orange powder becomes a reality on the market.

The personnel of Florida Foods fully realize their responsibility in launching such an ambitious program for a new product. Investors have been generous enough to entrust us with millions of their dollars; the citrus industry has been very kind in its commendations and suggestions and the public has shown a genuine interest in purchasing the product. It is our hope that added manufacturing facilities will be needed to process the Florida Citrus Crops—and to satisfy the public demand for high grade

products of this nature.

#### THE UNITED STATES HORTICULTURAL COUNCIL AND FUTURE CITRUS EXPORTS

(Continued from page 11)  
Government does not release dollar exchange nor purchases can be made.

The second important factor is that if we seek outlets abroad, we must provide some means for countries to make payment. There are only two important ways of doing this,—through loans or the purchase of goods and services abroad. Loans, at the best, are only a stopgap. Consequently, if the Florida citrus industry is not willing to lend its support to a national policy of exchanging goods and services with other nations, it cannot and should not expect, in the long

run, much from an export deal. If we haven't learned it, let us now learn the simple lesson that in the long run any nation which sells abroad must also buy abroad an equivalent in goods and services.

In spite of the limitations mentioned, if we will do the job which needs to be done in building our export market, the opportunities appear to be greater than many imagine. With capable leadership and giving proper backing and cooperation to the program of the United States Horticultural Council in working out major policies and problems, the Florida citrus industry can play a prominent part in post-war foreign trade.

—1/ This factor together with the technical difficulties and risks involved almost precludes individual shippers from overseas trade.

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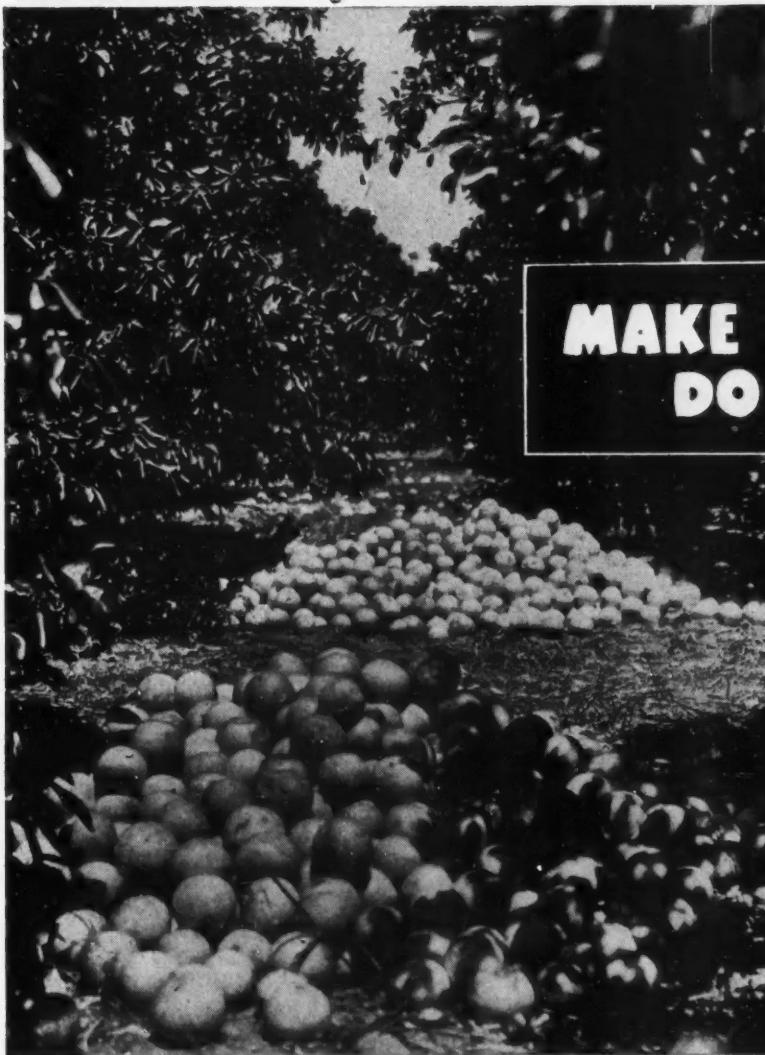
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**PRESENT STATUS OF DDT  
AS AN INSECTICIDE**  
(Continued from page 9)

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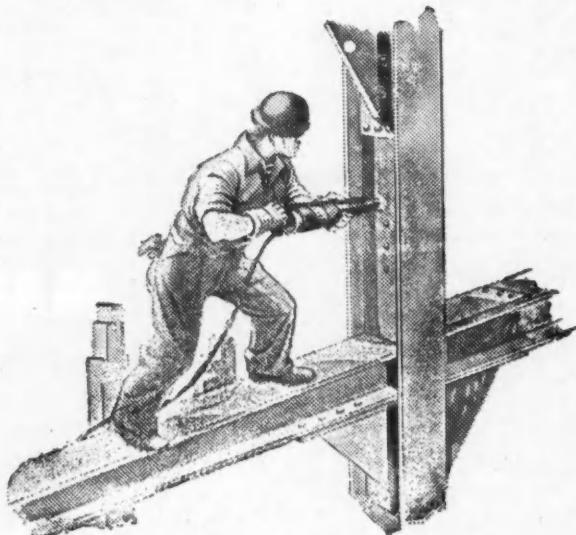
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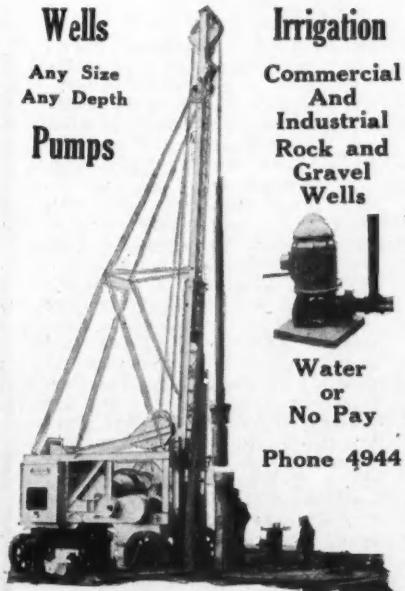
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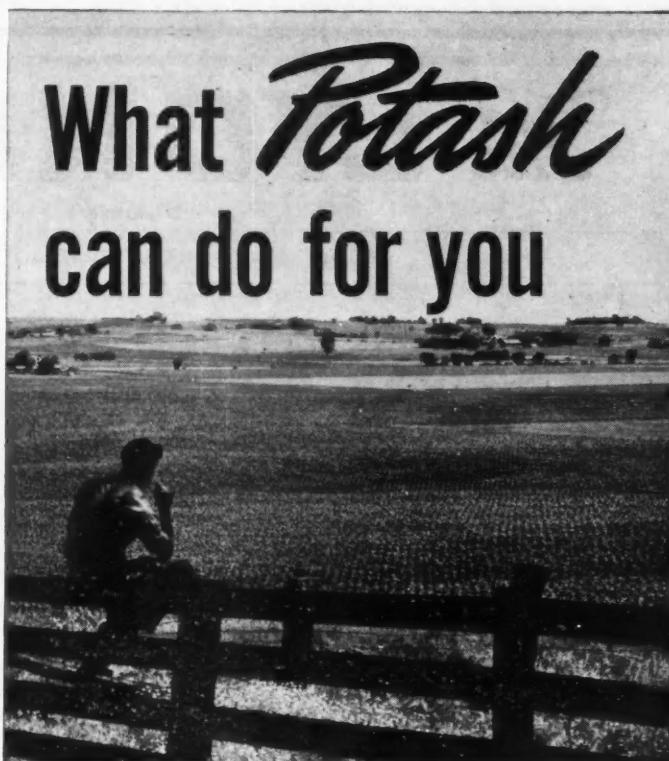
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## Reports Of Our Field Men . . .

### POLK COUNTY J. M. (Jim) Sample

The cool weather of the past few weeks coupled with several very nice rains to keep trees in excellent condition are indications that point to a normal bloom this spring. These are just the conditions that we have been hoping for, and barring disasters for the next two months we should have our trees start blooming at the normal time. Fruit has been moving at a rapid rate and we are now beginning to feel the scarcity of the early bloom. However, the later bloom is beginning to ripen and we should experience no difficulty in keeping a steady flow of fruit to both the canners and the packing houses. Our spring application of fertilizer will get under way in January and most growers will be busy with this operation through February. Most growers are also planning to come in with their dormant spray and this is to be followed with a complete program throughout the year. We are still having trouble with scale insects and many growers are using oil in spite of the hazards of cold weather. Fruit prices are within a satisfactory range and it is hoped that prevailing prices will continue through the season.

### NORTH CENTRAL FLORIDA V. E. (Val) Bourland

The cold snap that occurred during the early part of December played havoc with vegetable crops in this territory with losses running heavy on all crops except cabbage and celery. Some celery is now being moved from the Zellwood area and shipments will become heavier as the season gets under way. Growers are busy with their fall application of fertilizer and this will not be completed until in late January. We have been moving a heavy volume of fruit from this area and prices have been very satisfactory. There is considerable activity at the present time being shown by the fruit buyers which is a comforting experience for the growers. We have our diseases and

insects well under control, but shortly after the first of the year will see a renewal of the spray program that will be followed through in detail to produce a large crop of real quality fruit for the coming season. There will be a large watermelon acreage in this territory this year. Lake County will have one of the largest plantings of melons in many years.

### WEST CENTRAL FLORIDA A. E. (Mac) McCartney

The cold weather so far has not hit this territory to any damaging extent, but there were several times when it looked as if we might get some freezing weather. However, so far we have been fortunate and growers are resting easy until the next threat. The pickers are complaining about having to spot-pick and the packing house foreman is complaining about green fruit coming to the house. Due to the several blooms, it is a problem, but one that will be worked out over the season. To date growers have been successful in moving their tangerines at a very good price and with the late bloom we are going to be in a position to place good tangerines on the market over a much longer shipping season than in former years. Trees are in very fine shape throughout this territory and if we can continue to get an occasional shower we should set a very fine crop of fruit this spring. Our customers are planning to get started with their top dresser application in January and will have this completed during February.

### HILLSBOROUGH & PINELLAS COUNTIES

C. S. (Charlie) Little

We have had ample rains this fall to maintain our trees in excellent condition, and while a great deal of fruit is small, the quality is very good, the yield in some cases will be better than was at first anticipated. Grapefruit in particular is small but we have never seen fruit with

better eating qualities. Mid-season fruit is moving very fast and most packing houses are working nights in an effort to take care of the rush of Christmas business. The canners have been very active in this territory and are paying good prices, which of course means that they are getting a considerable portion of the crop. We have been fortunate as far as the several cold spells are concerned. While we have had some scorched foliage in low places we have not had any fruit or wood damage. Our tangerine crop was not too heavy in this territory but what we had has been moving to market at a rapid rate and at good prices. Some growers have just finished their fall application of fertilizer while others that fertilized early in the fall are planning to come in with spring application in late January and early February.

### SOUTHWEST FLORIDA Eaves Allison

The dry spell was broken by a good rain early in December and another around the middle of the month. These rains were general and the groves and vegetable crops have been greatly benefited. We have had several pretty snappy cold spells but fruit damage has been light, and to vegetables, only squash and cucumbers were damaged to any extent. Fruit movements have been good with the buyers on the lookout for early fruit. Late bloom fruit is sizing up well and seems to be of excellent quality. This crop will in all probability come in with the valencias. Considerable attention is being paid to the inclusion of secondaries in both citrus and vegetable fertilizers and trees and crops are showing the results of this practice. In the future it will be only in rare cases where a complete range of secondaries will not be used in all fertilizers. Vegetable growers are getting the land ready for spring crops and the acreage will probably be somewhat larger than last spring. The citrus groves are rapidly recovering from their recent damage of the drought and hurricane and by another season should be back in first class condition.

## ADVERTISEMENT—LYONS FERTILIZER COMPANY



It ain't a bad thing for folks to take stock at this season of the year and see what the past year has done to or for you . . . personally it 'pears to us that the year which has just closed has been mighty good to the citrus and vegetable growers of this state the past year . . . and most of 'em is feelin' right optimistic over the year to come, and are plannin' to produce bigger and better crops in 1946 than ever before . . . 'course some of 'em has made mistakes and they'll profit by those mistakes in the future, even to the extent of followin' the example of neighbors who may have more fortune in production practices than they have been.

Aside from every other thing which there is to be thankful for . . . every blessed one of us ought to be plumb grateful that the war is over and that the boys are comin' home once more . . . peace should mean a great deal to everyone of us . . . and it is up to us to see that it is maintained, so that these brave lads of ours who fought and died so valiantly won't have to ever go to war again, nor their children nor their children's children. We all have an obligation to make a place for these returning veterans and to see that their efforts for us are rewarded with opportunities which they so richly deserve.

This here DDT that they has been so much talk about has done demonstrated again that its tops as a potatoe insecticide . . . tests at the University of Wisconsin shore did the potato bugs a heap of damage . . . they tried DDT at the three percent level for dustin', usin' 15 pounds of a DDT preparation called AK-20 along with 13½ pounds of tribasic copper sulphate, 4½ pounds of rye flour and 80 pounds of pyrophyllite. The dust was put on at the rate of 35 pounds to the acre in six treatments about 7 to 10 days apart . . . and they got 278 bushels of taters of U. S. No. 1 grade against a yield of 231 bushels where the taters was dusted with a similar material 'ceptin' that DDT was replaced with 8 pounds of calcium arsenate.

So far weather conditions has been mighty good for citrus trees this fall and it's a purty shore bet that they'll be a normal bloom of fruit in the spring... bearin' this in mind the grower should put his fertilizer and spray program in effect right now and foller it through if he expects to get the largest yield of top fruit next season . . . yore fertilizer man can be a heap of help to you in suggestin' what program of fertilizin' and insecticides you should use for the best results.

**Uncle Bill**

## The Freezing Preservation Of Citrus Hearts

The characteristics and nutritional values of fresh foods are more nearly preserved by freezing than by any other method of preservation. The bright natural colors are retained that are destroyed under high temperatures necessary for canning. In texture and flavor, also, the frozen foods are very similar to the fresh, for freezing preserves the crisp, firm texture, the mild, pleasing flavors and most of the nutritive value of the fresh products.

Citrus fruits when heated lose their flavor, texture and nutritive value, more so than do other fruits. Cooking does not change the taste of most fruits as much as it does citrus. Most cooked fruit have a pleasant taste and the taste of some are even improved by cooking but any heat used on citrus fruits detracts from the appearance and flavor materially. We have therefore looked for other means of preserving citrus hearts other than canning and have found freezing to be ideal for the preservation of flavor, texture, appearance and quality of all types and varieties of citrus.

### Freezing Grapefruit Hearts

The work on grapefruit freezing was started several years ago and the effects of various things were determined, namely, variety, method of preparation, syrup concentration, deaeration, inert gases, anti-oxidants, temperature, storage temperature and packing.

Various varieties of mature grapefruit were tried and comparisons as to their suitability for frozen hearts determined. Taste, color, texture, quality, acidity, appearance and Vitamin C were determined at intervals, over a period of 12 months, the test being made directly upon the thawing.

Silver Cluster, Duncan, Excelsior, Florida Common, Marsh Seedless and Thompson Pink were tried, and their value for freezing as hearts was found to be in the order named above. All of the seedy varieties were far superior to the seedless varieties, the only disadvantage being the labor of removing the seeds.

Several methods of preparation of the hearts were compared as to the effect on the frozen product. The common method of hot lye peeling and hand sectioning of grapefruit where the sections were exposed to

By Dr. A. L. Stahl

Associate Horticulturist, University of Florida Agricultural Experiment Station. At Meeting of Florida State Horticultural Society

the air until packaged which is used by the canners at the present time was compared with a controlled method of using precooled fruit peeled either by hand or mechanically without the use of lye

or hot water and sectioned by hand, hearts being immediately subjected to a slight vacuum and the vacuum broken with CO<sub>2</sub> gas. The fruit was packaged before it reached room temperature.

In all cases the best samples were obtained using the second method. Heat was found to cause the oxidized flavor and darkening more readily than anything else.

(Continued on page 22)

### PUMPS

### PIPE

**IRRIGATION SUPPLIES  
MACHINERY, MILL AND INDUSTRIAL SUPPLIES  
CITRUS AND VEGETABLE CANNING AND PACKING  
SUPPLIES**

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**FLEX-O-SEAL:** Pressure Tight Portable Pipe

**TURBINE PUMPS:** Deepwell "PEERLESS"  
**CENTRIFUGAL PUMPS:** "GOULDS"



This field has 4 shallow wells. Pump and pipe are moved about freely.



Perf-O-Rain is so flexible it can serve every grove condition to advantage.

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# HOW NATURE PLANS FOR HER OWN VITAL NEEDS

**World's only source of Natural Nitrate in Chile long a safeguard against hunger and hardship**



Huge electric shovels—made in the U.S.A.—rip natural nitrate ore from the earth in Chile. This is the raw "caliche" just as Nature created it.

PEOPLE are apt to think of Chilean Nitrate as a free-flowing nitrogen fertilizer, easy to handle and distribute on the farm—ideal for every need and especially for direct application on fruit, vegetable, and other high-value crops where every safeguard must be provided to protect and insure the investment in high yields and top quality.

Behind the finished product, there is a complicated production problem, because like other natural products, Chilean Nitrate has to be mined, refined, and processed before it is ready for use. This requires great factories and power equipment and the labor of thousands of workers. Back of production, however, there is the dramatic story of the tremendous deposits of natural nitrate ore themselves. Formed in some

mysterious manner, centuries ago, they are a spectacular example of Nature's scientific planning for future needs. Through the ages, this immense storehouse of rich, natural fertility, established high up in the vast, rainless desert of northern Chile, has existed to give assurance of freedom from the menace of starvation to the people of all countries.

The only natural nitrate in the world, Chilean Nitrate combines maximum efficiency with low cost. Growers know it to be dependable, efficient, profitable; quick, safe and sure. After 100 years' experience, they have learned to depend upon it—to prefer it for all their crops. Just being natural seems to make it different from any other kind.

## **Easy to Handle... Easy to Use**

Natural Chilean Nitrate comes in two forms—Champion brand and Old Style. It reaches you in fine mechanical condition, in even-weight bags, for easy storage and handling.

*Natural*  
**CHILEAN NITRATE**  
*of SODA*

**THE FREEZING PRESERVATION OF CITRUS HEARTS**  
(Continued from page 20)

Removing the air from the hearts and quickly placing it in an atmosphere free from oxygen was important in obtaining a good frozen product.

Samples of grapefruit hearts were prepared in dry pack and in their own juice and in various percentages of sugar syrups (sucrose) from 10 to 60 percent. The best results were obtained with the liquids as there was much less darkening and drying out in these samples than in those dry packed. The best samples were those which were deaerated completely and the vacuum released with the syrup which would then penetrate the intercellular spaces and thus exclude all air from these spaces. The 20 to 30 percent syrup samples were preferred by most of the tasters but for best all around fresh fruit taste those hearts frozen in their own juice could not be surpassed.

When dextrose syrup was substituted wholly for sucrose the result was not good, a much crystallization of sugar occurred, but a half dextrose and half sucrose syrup was very satisfactory.

Deaeration proved to be very advantageous in the preparation of frozen hearts. No oxidation or darkening occurred in those samples that were deaerated. The best product was produced when the hearts were placed in vacuum directly after sectioning and the vacuum released with the medium (juice or sugar solution) and the whole mass deaerated just before packing. A slight vacuum pulled on the can jar or bag gave better products than those not vacuumized before packing either in the can, glass jar or cellophane bag. From the results it could be concluded that deaeration is very important in putting up a first-class grapefruit heart product.

Two inert gases were used in two different ways. Carbon dioxide and nitrogen gas were both bubbled through the finished product just before packing as well as both being used to release the vacuum to which the hearts were subjected. Both gases proved beneficial and were equal in value. The nitrogen gas brought out all the fruity flavors of the fruit, accentuating all of the taste testers, while the slight carbonation of the SO<sub>2</sub> gas covered up any off flavors that might be present. The method in which it was applied was not important as good results were obtained by both methods.

(Concluded next issue)

Pasco County now has 23 4-H

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**Colgate's Pearl Granulated Soap**

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clubs for girls with a total enrollment of 194 members, according to Mrs. Essa D. Shaw, home agent.

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The rate for advertisements of this nature is only five cents per word for each insertion. You may count the number of words you have, multiply it by five, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

**FOR SALE**— ONE 20-H.P. Farquhar Locomotive Type Boiler in good condition. Garland C. Norris, P. O. Box 692, Lakeland, Florida.

**NOW BOOKING** orders for raising citrus trees on sour or lemon stock. John Grieshop Nursery, San Antonio, Florida.

**CITRUS TREES**—Best quality usual varieties on sour orange or rough lemon stock. Robt. P. Thornton, c/o Clay Hill Nurseries Co., Box 2880, Tampa, Florida.

**COMPLETE** Packing House equipment for sale. Two car load capacity. N. E. McConaghay, Satsuma, Alabama.

**FOR SALE**— Speed Sprayer with new engine and radiator; both heads; first-class shape. Waverly Growers Cooperative.

**WANT A SUPERINTENDENT** for a 400 acre Citrus Grove at Howey, Florida, young, a worker, farm background, and able to handle help and reduce operating costs—good salary. House and Bonus depending on costs and production. Address Hith Howey, Florida.

**WANTED TO BUY — REAL ESTATE** — My wife and I desire ten (10) acres or more citrus grove plus additional acreage and home or homesite. Immediate possession not required. Furnish full particulars. Cash or mortgage as you desire. N. W. Oppenheim 155 Humes Place, Memphis 11, Tenn.